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"Poscentes vario multum diversa palato."—Hor. Lib. ii. Ep. 2.

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ON THE COST OF DIGGING SHAFTS AND CANALS, AS AFFECTED BY THE DEPTH OF THE EXCAVATION.

The labor of removing any given mass of earth, from a shaft or canal, may be resolved into two parts. The first consists in loosening the earth, by a pick or otherwise, and casting it upon a stage, or into a cart, barrow, or bucket. This part of the work is independent of the depth at which the excavation is made, and its cost, in the same kind of soil, should therefore be constant. The second portion of the labor consists in raising the earth to the surface of the ground, and transporting it to the necessary distance from the edge of the canal or pit. Now the labor required for this purpose, must evidently depend upon the depth at which the excavation is made; and, indeed, it appears to me, that it must be directly proportional to the depth. This supposition, at least, will probably give as near an approximation to the truth, as any mathematical hypothesis that can be adopted on the subject. If it be correct, then the price P of removing a cubic yard of earth from the depth of x feet, may be expressed by an equation of the form $P=a+bx$. Adopting this hypothesis, let us consider the solution of the following general problem.

The cost, in cents, of removing a cubic yard of earth from the depth of x feet, being $a+bx$, what will be the whole cost P of sinking a shaft, pit, or canal, of a given form, and to a given depth?

Let s be the surface of a section of the excavation, corresponding to the depth x, and which may, in general, be considered as a function of x. Let also dx be the thickness of the section s: then will its mass or volume be sdx.

Now, by our hypothesis, its costs $a+bx$ cents, to remove a cubic yard of earth, from the depth x. Consequently the cost of removing the volume sdx, will be expressed by the differential equation

$$dP=(a+bx)\,sdx.$$

Wherefore

$$P=\int.(a+bx)\,sdx.$$

This formula is general. To apply it in any particular case, we must, from the conditions of the problem, express s in terms of x and known quantities, and then integrate the resulting equation. I shall proceed to do this in one or two practical cases.

First, let it be required to determine the cost of making an excavation of a cylindrical or prismatic form, such as a well, shaft, pit, or cellar.

In this case we have s constant, and therefore our formula becomes simply

$$P=s.\int(adx+bxdx).$$
$$=s(ax+\tfrac{1}{2}bx^2).$$

I omit the constant quantity, in the integration, because, from the nature of the problem, $x=0$, must always give $P=0$.

Our value of P consists of two terms. Let us analyze their meanings. First, then, we have sx evidently equal to the volume of earth to be removed; and consequently asx the first term, is that part of the whole cost which is independent of the depth, and which is to be paid for the loosening and the first handling of the earth. The remaining term $\frac{1}{2}sbx^2$ or $b.\frac{1}{2}x.sx$, expresses the cost of raising the earth; and it is evident, from the expression itself, that this cost is the same, as if all the earth sx had to be raised from the depth $\frac{1}{2}x$. Now, as the first part of the cost is inde-

pendent of the depth, we may draw from our problem the following practical conclusion.—*To estimate the cost of sinking a shaft, or pit, we have only to suppose that all the earth has to be removed from half the depth of the excavation.*

If there should be portions of the shaft of greater difficulty than the rest, the values of a and b must be altered for such portions, and we must consider their whole masses as placed at their middle depths.

Let it now be required to determine the cost of excavating a trench or canal, having the usual form, which is that of a segment of a wedge.

A remark which I have made above, enables us to separate our problem into two parts. That part of the cost which is independent of the depth, depends merely upon the quantity of excavation, and may always be found by common mensuration. The second portion of the cost, or that which depends upon the depth, is more difficult to estimate. I have shown, however, that it is expressed by the formula

$$p = \int .bsxdx;$$

where s is a function of x.

To apply this theorem to the present case, let us suppose the wedge, of which the canal is a segment, to be completed, and let h be its entire depth, and S the area of its horizontal surface, both of which are either directly given, or easily calculated from the data; then, since s is the area of a section, at the depth x, parallel to the horizontal surface, and of the same length, we ahall evidently have, by similar triangles,

$$s : S :: h - x : h.$$

Whence,

$$s = S.\ \frac{h-x}{h} = s - \frac{s}{h}x.$$

Therefore, by substitution,

$$p = b.\int (sxdx - \frac{s}{h}x^2\,dx).$$
$$= bs.\ (\tfrac{1}{2}x^2 - \tfrac{1}{3h}x^3.)$$

If the excavation be completed, to the point of the wedge, we must suppose $x = h$, and we shall have

$$p = bs.\ (\frac{h^2}{2} - \frac{h^2}{3})$$
$$= bs.\ \frac{h^2}{6} = b.\ \frac{sh}{2}.\frac{h}{3}.$$

Of this expression, $\frac{sh}{2}$ is the volume to be removed, and therefore the cost of raising it is the same, as if it were all raised from the depth $\frac{h}{3}$, or one third of that of the trench.

When the trench is of a trapezoidal form, as is usual in canals, races, ditches, &c., then we must suppose x equal to the given depth of the trench, and use the formula

$$p = bs.\ (\frac{x^2}{2} - \frac{x^2}{3h}.)$$

But the theorem $p = b.\int sxdx$, gives rise to an observation which will enable us to generalize our results in a very remarkable manner, and to bring our problem perfectly within the reach of the practical engineer.

Since sdx measures the volume of an elementary stratum of earth, at the distance x below the horizontal surface of the trench, $x.sdx$ will express, in mechanics, the *moment* of the weight of this stratum, with reference to the same surface, and $\int x.sdx$ the sum of the moments of the strata, composing the whole earth to be excavated. Now, by a known principle of statics, the sum of the moments just considered, is equal to the product of the whole mass into the distance of its centre of gravity below the horizontal plane from which the moments were counted. But it is the quantity $\int sxdx$, which is multiplied by b, to give that part of the cost of excavation, which is independent of the depth, and which we are now considering. We infer, therefore, that this is the same as if all the earth were to be taken from a depth equal to that of the centre of gravity of the trench. As to the former part of the cost, it matters not from what depth we consider the earth as taken. Consequently, we may now deduce, from our investigation, the following practical rule.—*To estimate the cost of making an excavation of any form whatever, you must suppose that all the earth has to be removed from a depth equal to that of the centre of gravity of the excavation.*

The depth of the centre of gravity of a canal, is evidently the same as that of the centre of gravity of its transverse section; and this may always be readily found by geometrical construction, or even by cutting the form of the section out of pasteboard, and determining the point by which it may be supported horizontally.

The application of our rule is thus made accessible to every one, in all the ordinary cases in which it is likely to be employed;

and it appears to me that it might often be useful in directing the judgment of engineers, in making their estimates and contracts.

TREVOR.

THE MUSEUM.

Hoc primus repetas opus, hoc postremus omittas.

HOR.

Let this be the first work you take, and the last you discontinue.

On our complaining, the other day, to one of our neighbours, a shrewd experienced man, whom we consult in all matters of importance, that this Journal, though taken in almost all the states in the Union, had not met with as general a support as we had fondly anticipated, he ascribed our disappointment to a cause, which, it is probable, had never occurred to any of us, and that was, our excessive *modesty*. He sensibly remarked, that we could not expect other people to think highly of us, if we did not think highly of ourselves: that if we were contented with merely publishing ingenious and learned essays, without reminding the world of their excellence, we must not think it strange, if the world should remain in ignorance of it, except, perhaps, here and there, some moping scholar or philosopher, who would, probably, be more disposed to conceal our merits than to make them known. He reminded us of the very different course pursued in the common concerns of life, where good sense is to be found, if any where; that when a shopkeeper shews his wares to another, he is not so silly as to trust to the eyes of the customer, but, with great distinctness, and emphasis, points out to him the good qualities of his merchandize, and that they are of a kind which will exactly suit him. The farmer, too, is not slow to communicate every thing he knows in favor of his wheat, or his hay, his beef, mutton or lamb. Even the auctioneer, though he is often as great a stranger to the articles he is selling, as the bidders around him, feels no hesitation in stating their various good qualities, lest they should escape observation. But of all classes of men, he thought there were none who so clearly proved the wisdom of the practice, as the inventors and sellers of valuable medicines; he added, however, that while these ingenious persons divested themselves of all false modesty, by freely stating the virtues of their specific, they exhibited examples of *real* modesty, in substantiating their own allegations, by the certificates of disinterested persons, in whose representations of their own experience, the public might repose implicit confidence, as that they were cured of a dropsy or dysentery, of consumption or palsy, by taking a certain number of doses of their sanative compounds. He concluded by recommending to us to adopt a new course, and to tell the public, what we were no doubt already convinced of, that there was no Journal, which would afford them so much information for so little money as ours; that in this they would at once find solidity and variety; innocent amusement blended with valuable instruction.

We have since pondered on this advice of our friend, and have determined to profit by it; not indeed by being our own trumpeters,—that we disdain; but by publishing those testimonials which we have received from others of the benefits which they have derived from the Museum; and we doubt not that many, influenced by their example, will hasten to provide themselves with this our moral and intellectual panacea, when they can obtain a year's supply for little more than they must give for a bottle of Mr. Swaim's. The following commendatory epistles have been received from persons distinguished for veracity and respectability.

Messrs. Editors,

I am a subscriber to your valuable Journal, and it gives me pleasure to assure you that it has proved very instructive to every member of my family. My daughters gives the preference to the poetry and tales, and especially the *boiled man*. My son is most pleased with the extracts from Jefferson's memoirs, as he is a great polititician; I like your remarks on manufactures; and as to my wife, she says it is all mighty fine.

With grateful thanks for the favor you have done us, I am, gentlemen, your obedient servant,

SAMUEL SHUCKS.

Gentlemen,

There is a little *coterie* of us who have been in the habit of taking the Casket, the Album, and several other periodical works, and there is not one in which we

find poetry of the same high order as in the Museum, or which so abounds with literary lore. We meet every Saturday night at each other's houses, to discuss the merits of the last number, and we find it admirably adapted to this our "feast of reason and flow of soul." That you may continue to diffuse your beneficent light over the land, is the heartfelt wish of your fervent admirer.

AMANDA MAZARINE.

Mr. Publisher of the Museum,

I has red your paper, and thinks it the most valuablest paper that is; at least in our country, and don't begrudge you the money; for it always stops my wife's mouth, at least for half a day.

Yours to command,

HEN: PECK.

Respected Sirs,

I belong to the tribe of preceptors, vulgarly called, schoolmasters, and I can, of a verity, assure you that I highly approve of your weekly publication, styled by you "the literary and scientific Museum," &c.; it not being necessary to cite to you the title, at full length. There is no part of your lucubrations which seem to have a greater tendency to render important service to the community than those on the *onomatopœia*, and the vernacular forms of speech, some of which, nay, many of them, and, perhaps, I may say, nearly all of them, were somewhat new to me. But I forbear to make any further remarks on this interesting subject, as I mean to reserve them for a future contribution. I will, however, now observe, that your paper, appearing but once a week, can, with no propriety of language, be termed a *journal*.

With sentiments of profound respect, I am, learned Sirs,

Your friend and well wisher,

OLDFIELD BIRCH.

Gentlemen,

I have read your elegant compositions on the various subjects of science and literature, philosophy, philology, meteorology and statistics, and think they will be, in the highest degree, conducive to the public interests, the rights of the people, and the sovereignty of the states. The people, sirs, can never exercise too active a vigilance over those who undertake to instruct and enlighten them, or too strict a jealousy over those whom they entrust with power. Cromwell, under the show of asserting the rights of conscience, trampled on the liberties of the country; Cæsar, listening to the suggestions of unprincipled ambition, erected a throne upon the broken altars of freedom; and Buonaparte, while in the act of proclaiming "liberty and equality" to all, aimed at universal and unlimited monarchy. Such are my sentiments, gentlemen, and I freely give you my permission to promulgate them through your valuable paper, as well as to signify that I shall be a candidate for the General Assembly, in the county of ——— at the next election.

I am your fellow citizen,

M. T. GABBLETON.

OPERA.

To unite music and dancing with poetry had been the practice of very remote antiquity: at what time, and under what circumstances these arts were, afterwards, separately cultivated is not known. The Greeks were, for a long time, without the chorus on their stage, and without the lyre at their poetical banquets. The form which music had imparted to poetry alone remained, and lyrical composition merely preserved, in its name, the memory of ancient custom. In the temples alone it was kept up by singing pious hymns to music and dancing. The christian church, with the exclusion of dancing, adopted the antient practice and sanctified it by changing the subject of the hymns, or, often, by merely putting a sacred name for one profane.

At what precise period music, in company with poetry, was again introduced on the stage, and thereby laid the foundation for the opera of the present day, is not yet well made out. But from what is known as certain, there cannot be any doubt that we are indebted for this species of dramatic entertainments to the Italians, who, from their innate talent, seem to have been fitted by nature to be the instructors in music to all nations. Arteaga, a Spaniard, who wrote a history of the opera, informs us, that, at an early period, the Italians had set to music some of those pious farces called mysteries, which, for a considerable time, constituted the only theatrical exhibitions in Europe. But it was not before the end of the sixteenth century that music be-

gan to appear with distinction on the Italian stage, and then only as an accompaniment of lyric poetry in the way of interlude, and seldom connected with the subject of the play. From that time, music became more frequent on the stage, and more in unison with the dramatic performance. Scenic decoration was also brought to a high degree of perfection, to which the prevailing taste for splendid fetes, at the courts of the different princes of Italy, powerfully contributed. These festivities were mostly connected with allegorical representations of some sacred subject, such as the rebellion of the angels in heaven, the nativity of Christ, the miracles of the saints, &c. From this circumstance some authors have maintained, especially those who hold the machinery, painting, and the scenic illusions thereby effected, to be the essentials of the Opera, that it has taken its origin from those very festivities, and especially from those established in 1489 on occasion of the marriage between Galeazzo, Duke of Milan, and Isabella, Princess of Arragon.

The first attempts at tragedy, the dialogue of which was accompanied by music, were more or less failures, but this species of dramatic works, continuing to be encouraged, fell by degrees, into more skilful hands, by whom it was brought to that state of improvement in which Apostolo Zeno found it. Among those who, towards the end of the sixteenth century, laboured successfully for the Opera, Octavio Rinucci holds the first rank : his operas, with respect to musical worth and propriety of style were, till the time of Apostolo Zeno, esteemed the best of the kind.

It is remarkable, however, that, notwithstanding the high favour in which this species of theatrical amusement stood with the Italian public, it was a spectacle they enjoyed only on very grand and extraordinary occasions. The first building, for the purpose of their affording more frequently this delightful diversion to the people, was erected in Venice, towards the middle of the seventeenth century. Every Italian town of any note followed the example of Venice. From Italy the opera soon spread over the most distant countries of Europe, and having now passed the Atlantic it bids fair to become a great favourite of America.

The taste of the sixteenth century for magnificence, and the particular occasions on which lyrical plays were performed, were the cause that they endeavoured rather to charm and strike the senses by splendid scenery, marvellous events, allegorical processions, &c. than to affect and edify the mind by sentiments, conformable to nature, and by a well conducted action, founded on truth and real life. The opera, therefore, preserved, for a long time, the character which it had received from the circumstances attending its first cultivation. Scenic machinery and music improved, while poetry not merely made no progress but seemed even to retrograde. That there ought to be probability and interest in a dramatic work, was never thought of : they took a subject from heathen mythology, made it, by absurd additions, more wonderfully strange than it was of itself, and quietly left it to a *Deus ex machina* to unravel the most intricate plot. The marvellous was accumulated in the most irrational manner ; the characters were exaggerated beyond all semblance of reality ; the dialogue was trivial and childish. At length, Guinault, in France, by introducing a nobler language, improved the poetical worth of the opera, and surpassed the dramatic poets of Italy by delicacy of taste, richness of imagination, and truth in pourtraying the passions.

Arteaga conjectures, that one cause of improving the poetry of the opera might have been the necessity under which stage managers often found themselves placed, of making retrenchments in their expenses for getting it up. As authors would then endeavour to supply, by poetical beauties, what was wanting in scenic splendour, they in part laid mythology aside and began to choose their subjects from history. Carlo Maggi, Francesco Lemene and Stampiglia distinguished themselves in this new career. But Apostolo Zeno may really be considered the father of lyrical plays. This industrious and learned man had made essential improvements before Metastasio began, by a greater skill in versification, richness of ideas and energy of expression, to eclipse his well merited fame. Metastasio's merit does not however consist, merely, in these qualities, although they first attracted the admiration of the people. His principal merit lies in that judicious regard which he paid to the nature and object of the opera as a musical drama, and in the

self denying sacrifices, which his poetic genius was, therefore, often obliged to make to that of the musical composer. He knew that, if the poet will say all he can, if he will develope every character, paint every feeling to the utmost, nothing is left to the musical composer but here and there some sterile ornaments. Nor had it escaped him how often these musical ornaments destroy, in the poem, the very effect which the poet was so anxious to produce.

B.

(*To be continued.*)

SUGAR.

Saccharine substances.—Although we are acquainted with a great number of bodies having a sweet taste, chemists limit the term *sugar* to such only, as are capable of fermenting and forming spirit (*alcohol*) when mixed with yeast and water. The propriety of this definition may not appear obvious to general readers; yet it must be admitted that there is no characteristic more improper than the popular one of *sweetness*. There are several *mineral* compounds which possess it; but it will be sufficient merely to notice that of vinegar and lead, better known by the name of *sugar of lead* than by any other which is more expressive of composition. The following general view of saccharine substances may here be presented as being indicative of their formation. Such bodies have been effectually produced by means purely chemical, so that we must regard them both as *natural* and *artificial* products; but, however formed, the substances employed must be organic, i. e. derived from some portion of animal or vegetable matter. No *mineral* has ever yet been found to answer.

Organic matter is converted into Sugar.
- *Naturally*; i. e. during the life of
  - Plants.
    - . . . . Germination.
    - . . . . Vegetation.
  - Animals; as secretions.
    - healthy—Lactation, &c.
    - morbid—Diabetes, &c.
- *Artificially*; i. e. after life; by various . . . Chemical operations.

Some explanation will, perhaps, render this tabular view sufficiently intelligible; and serve, at the same time, as an appropriate introduction to the subject itself.

Germination and vegetation.—All seeds contain the root and leaf-stalk of the plant within their substance, and are *generally* divided into two parts called lobes or cotyledons. Some, however, have no lobes and others several. It is evident that the root and stem which they enclose, must be of the simplest construction, and their first growth constitutes an operation totally different from any which characterises them in their mature state. Before the young plant becomes extricated from the seed, if it grows at all, it is considered merely to germinate, and depends, for its support, upon the substance of the seed itself. Moisture, air, sunshine and other agents effect a chemical change in the lobes of the seed, by which several of its component parts are converted into sugar. The substance, which most contributes to the formation of sugar, under these circumstances, is starch. Germination gives a sweet taste to almost all seeds and it is generally considered, that sugar is more favorable to the growth of embryo plants than any other body known. So productive is this operation of sugar that advantage is taken of it in brewing. *Malt* consists merely of barley, which, by steeping and exposure to warm air, has been made to commence germination. The process is stopped by stove or oven drying, and the sugar, thus formed, gives malt a sweet taste, which could not be distinguished previously. The following results of analysis made by Proust upon malted and unmalted barley will serve sufficiently to illustrate the formation of sugar during germination.

	Barley (100 parts.)	Malt (100 parts.)
Resin	1	1
Gum	4	15
Sugar	5	15
Gluten	3	1
Starch	32	56
Hordein	55	12

It thus appears, that malting trebles the amount of sugar. Hordein, according to Proust, is a substance peculiar to barley, while other chemists regard it merely as a modification of starch. It is the substance which diminishes most in quantity and is converted partly into sugar. Being *insoluble* it could not answer the purpose of nourishing the young plant, but during the

germination it changes into gum and sugar, two of the most soluble and nutritious substances known. The decompositions leading to these formations do not appear to be complicated. Simple heat converts starch into a kind of gum; and boiling it with dilute vitriolic acid (*sulphuric*) changes it into sugar. They are found actually to differ but little in composition.

The sugar formed during malting and germination is a liquid, and bears a resemblance to molasses.

Vegetation.—By a law of vegetable life, altogether inexplicable, at present, the young root as it leaves the seed, shoots down into the ground, while the stem or leaf-stalk takes the shortest practicable direction to the light above. As soon as these two objects have been accomplished, the plant commences to *vegetate* and (deriving but little support from the seed,) begins to take in food of a coarser quality, from the soil and atmosphere.

The young plant, at this early stage of existence, performs the same functions as the full grown one, and, accordingly, we find that the seed-lobes, soon after, begin to wither and drop off, except in some cases where they become converted into imperfect leaves. It is difficult to assign limits to these operations and, strictly speaking, the plant derives nourishment from its seed even during vegetation. But as the stalk is very slow in growing (from its deep position within the seed and the absence of light, while the root, being situated more superficially, soon comes in contact with the ground,) the substance of the seed goes almost entirely towards the developement of the root. During both these stages of vegetable existence sugar is formed, apparently with the view of supplying nourishment to the plant at periods, when its vital power becomes suspended or very much limited. I have already alluded to its occurrence during germination, when the force of life is exceedingly diminished; all plants however, are subject to the same abatement once a year. It commences with the fall of the leaves, and continues until the growth of new ones. During the period (winter and spring) when they are without leaves, they have no power of preparing food and would inevitably die were there not a sufficient supply provided previously. In the autumn, many of the acids and other secretions become converted into sugar, gum &c., which, being deposited throughout the stem and branches, are taken up again by the ascending sap in spring, thus enriching it and rendering it capable of supporting the growth of leaves. The leaf budding is the renovation of youth and, which uninterupted, speedily leads to the growth of the trunk branches, &c. So very important is the coming forth of leaves at this period to the existence of the plant, that when those, which *have* grown out are pulled off, the growth of the trunk stops, until the injury is removed by the appearance of the leaf buds of the next year. Sir J. Smith has remarked, that "there is great reason to suppose sugar not so properly an *original* secretion, as the result of a chemical change in secretions already formed, either of an acid or mucilaginous nature. In ripening fruits this change is most striking, and takes place very speedily, seeming to be greatly promoted by heat and light." Sugar has, indeed, been styled "the soul of vegetable creation," and as its formation very generally occurs in autumn, when vegetable life is declining, we may feel less reluctance in supposing that chemical changes largely contribute. There cannot be a finer illustration of this supposition than that furnished by the persimmon, or seed plum, immediately before and after a hard frost.

We are to bear in mind, however, that sugar, in many plants, is a *constant* secretion, and does not always necessarily contribute to their support. The sugar cane furnishes us with a very good example.

With respect to the parts of plants containing sugar, the following observations may be offered.

Flowers, almost invariably, furnish a sweet liquid, the tempting food of numerous insects. The fluid thus secreted is not only sweet but aromatic, and so closely resembles the fabled *nectar* of the gods, that its receptacles in the flower are actually called nectaries. Sometimes it is visible to the eye, clear as a gem and colourless; occurring as a liquid or solid grain; at other times it lies deeply hid within the flower, or by the narrow aperture of the nectary. Judging by aptitude, we might pronounce it the destined food of those insects, which are provided with suckers (*haustella*) and we seldom see any want of skill in procuring it. Bees, in particular, are ever in pursuit of it while blossoms last

and deposit it, with but little alteration, as honey By unwearied industry, they thus accumulate a quantity, the extent of which may be judged of, when we consider that, previous to the extensive cultivation of the cane, honey must have been used for all the common purposes of sugar. Notwithstanding this almost universal distribution of sugar among flowers, there is no instance where this substance can be extracted with advantage from any single kind.

Fruits.—In these we find, at some period of their growth, a considerable amount of sugar. In several cases, indeed, the quantity is so notable, that attempts have been made from time to time to extract it. But the difficulty generally has been to obtain the product in a solid state; as it seems to be of that kind, which will not crystallize. Heat often alters it so far as to give it the solid form, but the taste is, in general, far less sweet than that of the sugar, in common use. Figs furnish a large quantity of hard sugar, when they have been too much bruised in drying and exposed to moisture.

Seeds are seldom found to contain sugar *previous* to germination but there are very few cases indeed where it does not appear in them, during and after this process. Cerealious seed, or such as are used for making flour, are best adapted to the developement of sugar, because they always contain a large quantity of starch.

Leaves are, perhaps, naturally less furnished with sugar than any other parts, but it not unfrequently happens that their surface becomes covered with a thin coat of honey or other saccharine matter. Such exudations must be considered as effusions of peculiar secretions, for it has been observed that manna may be scraped from the leaves of the ash as well as procured by incisions from its stem. Sir J. Smith considers that they are "often perhaps a sign of unhealthiness in the plant; at least such appears to be nature of one kind of honey-dew, to which the beech, in particular, is subject, and which, in consequence of an unfavourable wind, covers its leaves in the form of a sweet exudation, similar, in flavour, to the liquor obtained from its trunk. So, likewise, the hop, according to Linnæus, is affected with the honey dew, and its flowers rendered abortive, in consequence of the attack of a catterpillar upon its roots. In such case the saccharine exudation must decidedly be of a morbid nature." The excrement of the Aphides, is of a saccharine character and no doubt is often mistaken for a *vegetable* secretion upon the leaves. In warm seasons leaves give out most of this honey dew, as may be witnessed in the linden and elm trees, particularly.

Trunks.—We have already alluded to the occurrence of sugar in these parts of plants. Many large trees contain it abundantly in their sap, among which may be specified the maples, birch, ash, &c. But, perhaps, plants of less perfect organization may be cited as more striking examples. Certainly no one, is so remarkable for its sugar as the sugar cane; and we find distributed through the pith of many others, allied to this, among these may be mentioned the bamboos, reeds, Indian corn, grasses, &c.

Roots.—We frequently find sugar in these; in one instance the *quality* is the same as that of the common sugar; and although the *quantity* is less, the sugar may be prepared at a cost actually not so great as that at which the other is commonly valued. This root is the beet. There are others in which sugar abounds, but, as it is not a hard species, it cannot be obtained in the dry state; such is the root of the sweet potatoe (*convolvulus batatas.*) The liquorice root contains a larger quantity of matter, strongly resembling sugar in its sweetness but not in its other properties. Carrots and parsnips, have enough of this substance in them to be sweet to the taste, but it is not sufficient in quantity to offer any inducement towards extracting it. Parsnips according to Bryant (*Fl. Diætetica,*) were formerly used in the north of Ireland, for making a kind of beer, being brewed, instead of malt, with hops, and fermented with yeast. We shall now proceed to notice briefly the formation of sugar among *animals.*

Lactation.—Sugar seems to be as necessary to the wants of infancy among animals as among plants. Mammiferous animals (or such as suckle their offspring) have periods, when the secretion of milk becomes not only very abundant but of a highly nutritious quality. Among the constituents of this fluid, sugar may be noticed as a very important one. It is not the same as common sugar nor is it included among true sugars (in consequence of its

inability to undergo spirituous fermentation;) yet it is equally nutritious and, in some other important particulars, bears a close resemblance. Sugar very rarely appears among animal products and is by no means as characteristic of them as of vegetable secretions; there appear to be examples, however, of a contrary nature. A very sweet tasted liquid, supposed to bear most resemblance to manna, seems to be constantly discharged from the bodies of the numerous species of insects belonging to the genus *Aphis*. The names of *pucuron*, *vine fretter*, *cabbage louse* &c. have been employed by naturalists to denominate some of them. Every different plant in the garden has to support a particular species and there is no one more completely infested than the rose: along the stem, around the tender buds, and under the leaves they may be detected in multitudes. No other insect or animal is so equivocal in generation and organization. The particular species which secrete upon plants this sugar or *honey dew*, as it is sometimes called, may almost always be readily distinguished by the immense concourse of ants in pursuit of and greedily devouring the saccharine matter. A far more interesting occurrence of animal sugar, however, is that which very frequently attends a disease of the human body, consisting of a colliquative secretion of urine.

Diabetes.—This substance exists in the urine; and we may consider it as the only instance of genuine sugar to be met with among animals. It may be made to ferment into spirit and bears a close resemblance to the sugar of grapes. Some further particulars will be mentioned hereafter.

Sugar *artificially prepared by means of chemical operations.*

To notice this part of our subject very particularly here, would be to anticipate the plan adopted in the present communication. Suffice it to say that there are many vegetable and some animal substances which may be made to assume the properties of gum and sugar. Starch, and jelly, in particular, become saccharine under such circumstances. Under this head should be included all the *spontaneous* changes of vegetable and animal matter, productive of sugar. Some fruits, as the pear and apple, if gathered before maturity, become sweeter by keeping. In these cases the changes of composition are not dependent upon vitality; they are spontaneous and of a chemical character. Generally speaking, *vegetable acids* thus become converted into sugar; "the formation of an acid may be regarded as one step towards the production of saccharine matter, a view which will account for the strong acidity of many fruits, such as the gooseberry and currant just before they begin to ripen." The grape, pine apple and other fruits, exported from warm climates to a distance, are sour and unripe, when packed up; but the conversion of their *acids* into *sugar* uniformly takes place under such circumstances. Sour apples are rendered sweet by simple roasting. And the occurrence of frost is known to produce a similar effect. Potatoes thus obtain a nauseous, sweet, taste; but the persimon is a more remarkable instance.

The absence of light has a tendency to make all strong tasted vegetables mild and sweet; celery and turnips, for example, are thus improved by being covered over, but when they grow in a strong light bitterness is far more characteristic, particularly in the turnip.

Such examples might be multiplied: this, however, will be unnecessary as the amount and quality of sugar produced are unknown and variable. It may be objected also, very reasonably, that the chemical agency, thus manifested, is often under the control of vitality

In addition to these general views the following table may be presented. It will serve to point out the different species of *true sugars*, and, at the same time, will complete the list of such other saccharine bodies as most resemble sugar.

True sugars.—When *alcoholic* fermentation *may be* effected by the addition of yeast and water.

Species.	Varieties.
1. . .	Hard sugar of the cane, maple, beet, chesnut &c.
2. . .	Liquid sugar, sugar of malt, sweet potatoe, molasses, honey &c.
3. . .	Hard sugar of the grape, ripe fruits, starch, diabetes &c.
4. . .	Hard sugar of mushroom.

Imperfect sugars.—When alcoholic fermentation *cannot be* effected by means of yeast and water.

Species.	Varieties.
1.	. . Manna.
2.	. . Sugar of milk.
3.	. . Sugar of jelly or glue, (gelatine).
4.	. . Liquorice and Sarcocol.
5.	. . Picromel. N.

(*To be continued.*)

BLONDEL AND RICHARD LION-HEART.

"King Richard is the beste
"That is found in any geste."

Prologue to "*Richard Cuer du Lyon.*"
A.D. 1300.

The authenticity of the tale, that Richard, *Coeur de Lion*, owed his liberty, when imprisoned in Germany, to the zeal and fidelity of his minstrel, Blondel de Nisle, has always been questioned. M. Sismondi, in his "*Historical View of the Literature of the South of Europe*," has asserted, that if the poetical dialogue had been preserved, it might have been some confirmation of an anecdote to which we are so willing to give credit. A German version of this *Tensor* was given in 1777, by the celebrated Wieland, along with the whole of the story, of which, the following is a translation, and which, although somewhat romantic, carries with it the air of probability.

Richard, surnamed *Lionheart*, (*Coeur de Lion*,) third king of England, of the house of Plantagenet, or Anjou, and second son of king Henry the second, ascended the English throne in the year 1189. A short while before this, the magnanimous Sultan, Saladin, after the celebrated battle near Tiberias, had again taken possession of Jerusalem and the holy sepulchre, (which, through the adventurous fanaticism of chivalric times, became the grave of some hundreds of thousands of European Christians,) and thereby inflamed Europe anew, with a general zeal to again remove and avenge the disgrace that, by this loss, according to the mode of representation of the time, had fallen on all christendom. In king Richard, the most valiant and chivalrous prince of his time, this zeal became a most violent passion. In that period of pecuniary scarcity, in order to raise the sums necessary for his intended crusades, he disposed of as much of the domains, revenue and regalia of the crown as he was able. "I would even sell London," said he, "if I could find a purchaser." King Philip Auguste, of France, joined him in this adventure; and if he, from his personal character and rank, believed he had the right of representing Agamemnon amongst the united armies of the crusaders, so had Richard, on the other hand, all the personal virtues and defects for playing the part of Achilles.

His even too romantic intrepidity and love of adventure, had joined him the surname of "*Lionheart*," and made him the hero of one of the most celebrated chivalric works of the thirteenth century: (*Warton's 'History of English Poetry,'* Vol. I.) His name was so formidable amongst the Saracens and Turks, that mothers, to quiet their children, were accustomed to threaten them with King Richard. Joinville, who relates this circumstance, in his life of Louis the pious, adds another and similar anecdote. When the Arabians were riding and their horses became startled at any unusual object, they were in the habit of exclaiming, on giving them the spur; what meanest thou? dost thou see King Richard? a stronger or more characteristic evidence of his prowess could scarcely be imagined. The romance writers of those times found something so wonderful in the chivalrous deeds of this Prince, that they considered he must have been in possession of the celebrated magical sword, *Kaliburn* or *Eskalibor* referred to in the fabulous history of King Arthur, although the *Romance of King Arthur* asserts that his esquire at the command of his lord, had, after his death, thrown it into the sea.*

Nevertheless, all the valiant deeds of this hero and his allies did not meet with the expected success. A fatal jealousy alienated the Christian Princes and enfeebled a power, which, by unanimity, might have been destructive to the Sara-

* It is gravely recorded by the chroniclers that Richard carried with him to the crusades this celebrated sword (*Calibura*) of King Arthur and that he presented it as a gift or relic of inestimable value to Tancred, King of Sicily, in the year 1191, in return for several vessels of gold and silver, horses, bales of silk, four great ships and fifteen gallies given by Tancred.

Robert of Brunne calls this sword a *jewel*.

"And Richard at that time gaf him a fair juele,
The good sword *Caliburne* which Arthur luffed
so weil." Xy.

cens. King Richard himself, was too proud and too violent in his passions not to suffer his personal superiority over the rest to be felt more strongly than prudence dictated. The King of France, the Duke of Burgundy, Leopold, Duke of Austria, who after the unfortunate death of the Emperor Frederick Red-beard and his son, had remained at the head of the German Crusaders, separated from him at the very time, when there was the greatest hope of freeing Jerusalem from the hands of the Unbelievers.

Richard remained alone: and the fruit of all his heroic deeds besides the conquest of Ascalon was a truce, whereby the possession of the little they had gained at so much expense and the liberty of visiting the holy sepulchre at Jerusalem without molestation was secured to the Christians for three months, three weeks, three days and three hours.

Expeditions like those, when powerful monarchs quitted their hereditary kingdoms and exhausted men and money to carry on adventures in a distant quarter of the globe, without plan or fixed object:—when with enormous forces at the end, nothing was effected and the whole undertaking even in the moment of certainty of complete success, was abandoned in the same giddy spirit with which it had been begun, a procedure of this kind, judged according to the principles of sound policy, necessarily seems to us irrational. But the crusades, and especially the part taken in them by King Richard, require to be expounded by the intoxication of knight errantry which at that time prevailed over the whole of Europe. The desire of Richard was merely to proceed to distant countries in search of adventures, to contend with Saracens, giants or lions and to afford to the minstrels, who accompanied him, matter for romances and books of chivalry. If he could attain this object the rest would trouble him but little. Attempts at permanent conquests, expeditions, of which a settled state of repose might be the fruit, at that time entered not into the thoughts of heroes. Men roamed about without having any other object than roaming: each one lived, as it were, on the adventures of the day: and was desirous of leaving himself and others work for the morrow. This was the spirit of chivalric times.

Richard had, at the seige of Ascalon and on other occasions, offended the Duke or Margrave of Austria, Leopold, in the most sensitive manner, and Leopold, who wanted courage to demand the satisfaction of a knight (which Richard would not have refused him) had returned home with the smothered rage of an impotent thirst for vengeance. But fate gave him an opportunity, which he could not have expected, for taking revenge on his enemy without placing his own person in danger and Richard's want of prudence delivered him quite unexpectedly, into his hands. King Richard, forced to return owing to the internal disquiets in his kingdom and the base invasion of his French hereditary provinces by King Philip, was shipwrecked near Aquileia, and at this place assumed the dress of a pilgrim, to travel *incognito* through Germany, as he did not consider himself safe in France.

In order to elude the snares of the Governor of Istria, he took a circuitous route by Vienna: and here, he betrayed himself, by an expensiveness and liberality, which, attracted considerable attention, in a pilgrim and especially as he had too much the air of a hero, to be considered that, which his mean clothing announced. In a short time Richard was discovered, taken up, and confined at Linz, in a narrow prison totally unworthy of his royal dignity. In this place the adventure is said to have taken place, which affords materials for the present story.

Richard had resided, during his youth, chiefly in his hereditary Frankish provinces, and a considerable part of the same had been spent in Provence, where the art of song, about this time, was in its highest bloom, and formed not only one of the most common enjoyments of the great at their banquets and festivities, but was even cultivated by many amongst themselves with considerable reputation, as it was, also, in the twelfth and thirteenth centuries in Germany. Here Richard imbibed his singular fondness for the art of the *trubadurs*, *troubadours* or minstrels, which never forsook him during his whole life. Love that has ever formed so many singers, made *him* also a Provençal poet; for the Provençal speech was, at that time, considered more agreeable and melodious than the French, and the proper language of the tender passions. In the sequel his court, like that of the Landgrave Hermann of Thuringia, was

the rendezvous of the most celebrated minstrels of his time, amongst whom Fouquet of Marseilles, Anslem Faydit and Blondel de Nesle were esteemed his favorites.

The last had, in the above mentioned crusade (in which, according to the expression of Massieu, whole legions of poets followed the French nobles,) devoted himself, particularly, to King Richard, and was an eye witness, and doubtless also a singer of his eminent deeds. It is probable that even at this time, the estimation of the poets had somewhat fallen from that which the bards and scalds had enjoyed in older times. For formerly the bards were considered men inspired by the gods and their office a sacred and public one. It was their duty to accompany the warriors on their expeditions, to sing to them the battle song, to be witnesses and judges of their heroic deeds, and, after the fight was ended, to recompense the valiant by songs of victory and, on the contrary, to stigmatize the cowardly by contempt and derision. This was in immediate relation with the constitution of the old Kelts, Germans and northern nations ; rude hordes, by no means populous, subsisting by the chase, spoliation and war, in whom the sentiment of freedom, combined with the pressure of necessity, induced this public spirit, of being as one man, whereby the great political nations might have no notion of their civil and military constitution : where every one attended to all and all to every one : where the personal virtues of a man were regarded as the common property of his caste or tribe, and contempt of life, if the common good demanded it, was the first of all virtues : and it must necessarily be so, for such small nations to continue their existence.

But all this in the times of chivalry and the crusades, no longer existed, owing to the great alteration of circumstances, amongst the descendants of these nations. The feudal system, by consequences entirely natural, had almost wholly annihilated this public spirit.

The vassals were more or less powerful and the most so amongst them became, almost entirely, independent lords. Each one troubled himself only with his own affairs, thought only of his own preservation and prosperity and kept his own court. The accidental connexions, which necessity or self-interest effected for the moment, were again disolved in a moment ; personal friendships amongst the knights and (what was probably extremely rare) personal fidelity towards the feudal lord, were the only bonds which were still strong enough to stand proof and to continue for the whole of life. In such circumstances the musical art could no longer perform the wonders it had previously effected. The minstrels were no longer indispensable springs of action, the exciters and nourishers of public spirit, and the poets and singers were no longer servants of the state. Like the constitution, and manners of the states, poetry and song became gradually changed and sank to mere arts of enjoyment, constituting a part of the luxury of the time. The *trubadurs* and minstrels were a kind of court servants, who were kept for pomp and amusement; they were still loved and even honoured ; but less on account of their actual merit, than because they knew how to make themselves indispensable to the entertainment of the great ; because their *lays* and *Fabliaux* were liked and because poetry, music, and the pantomimic art, which became subsequently separated, constituted at that time, but one profession and were carried on by one and the same master. The great might still indeed and naturally, desire to be celebrated by their poets ; but the praise they obtained, was less the merited price of their virtues, than a gratification of their vanity, and could, at last, only amount to this, that *he* was the most praised, who entertained and rewarded the most liberally. This however is a digression, which if prosecuted, would lead us too far from our subject.

Blondel had accompanied King Richard on his journey back from the holy land ; but by the storm that drove the king on the coast of Istria, the ship on board of which was the minstrel was forced into the Lagunæ of Venice. Blondel prosecuted his journey through Germany and the Netherlands, and, every where, sought after the king, his lord and friend, but fruitlessly. At length he went to England ; but there also nothing was known of what had become of Richard ; for his imprisonment remained, for a whole year, a secret. The minstrel determined to search out his beloved lord, if compelled to follow him over the whole world. He travelled, for a long time, in vain, till, at length, an ob-

scure, rumour, or a supposition, which the well known resentment existing between Richard and Leopold made probable, led him into the states of the latter.

After he had wandered about for several days without arriving at any nearer trace, he at length reached an old fortress, in the tower of which (as he discovered) a prisoner was narrowly guarded. Although no one could inform him any thing farther, it immediately struck him that this might be his sovereign. As however, it was impossible to render himself at all certain of this, by any common method, without being suspected ; he attempted the following plan. He found means late at night, to approach so near the tower and beneath the window of the prisoner that his voice could be heard by the latter ; and, after he had executed a prelude, for some time, on his guitar, he began a song which Richard himself had composed in Palestine, on the occasion of his love for the beautiful Margarite, countess of Hennegan : for the countess had, after the example of most of the ladies of that period, made herself distinguished in her zeal for the cross and had followed her spouse to the holy land. As it would afford the reader but little satisfaction if we (provided we could) were to give them this lay in the Provençal speech, in which Richard composed it, we have attempted a version of it ; hoping that it may possess more of the energy and *naviete* of the original, than the translation of Mademoiselle L'Heritier* (Wieland.†)

Blondel, now began to sing as follows:

" Fiercely glow'd in me the fever,
" Scorch'd was every vital band,
" Dimmer was the light than ever
" And forever,
" From the gloomy, shady land
" Stretched o'er me grim death his clay cold hand.
" Then came my love with gracious look,
" And death and fever from me took."

There the minstrel stopped : for the song had a chorus at each stanza, and he did not doubt that, if the prisoner was the same he was seeking, this circumstance would betray him.

His expectation was not disappointed. A hollow voice but, as he distinctly heard, one accustomed to the song proceeded from the interior of the tower and completed the stanza with the following chorus.

" I say it without blushing
" That sweet and valued name
" Assists in dangers rushing,
" And comforts mind and frame."

Blondel continued :

" All around with danger cover'd
" Strove I in the cruel fight,
" Thick as heaven's hail there hover'd
" Lance and halberd
" O'er me now with all their might,
" Already sank my arm and round me all was night :
" But when I call'd my fair again,
" A victor stood I on the plain."

The same voice answered :

" I say it without blushing
" That sweet and valued name,
" Assists in dangers rushing,
" And comforts mind and frame."

Blondel concluded with the last stanza of the song.

" Let the battle cry now call,
" Like as on the stormy sea,
" Winds they bluster, thunders roll,
" All things fall,
" All things go to wreck with me,
" From high courage is my heart yet never free ;
" No fate can cast me to the ground
" So long as love supports me round."

The voice responded again :—

" I say it without blushing,
" That sweet and valued name
" Assists in dangers rushing
" And comforts mind and frame."

Great was Blondel's joy : for he could now, hardly remain in doubt, that it was King Richard, who answered him : but, in order to convince himself still more completely, he added *ex tempore* the fourth stanza in the same manner :—

" Hate with base revenge befalls,
" At night, the Lion in the grove,
" They force him within gloomy walls
" So tarry all
" Love has hither Blondel drove
" Wait, Lionheart! thy bolts we'll soon remove."

And immediately the voice answered, also in an extempore manner :—

* In a small Romance but little known, bearing the title : *La tour tenebreuse et les jours lumineux.* Contes Anglois, tires d'anciens manuscrits, contenant la Chronique, les Fabliaux et autres Poesies de Richard surnomme Coeur de Lion, Paris 1705, 12 mo.

† The preceding remarks are by Wieland and the English is from the German version.

XY.

" Oh were Margot only by me,
" Heaven, I would say were nigh me!
" Why for this be blushing?
" That sweet and valued name
" Assists in dangers rushing
" And comforts mind and frame."

The faithful Blondel was now satisfied he had attained his object: but to afford his sovereign immediate assistance was impossible. Richard had, however, recognized the voice of his beloved minstrel and whether he believed it to be Blondel, or his spirit, it must have afforded him consolation and fortitude, after so long a death like silence and neglect from all that were dear to him, to hear the voice of a friend, which promised him freedom.

Blondel hastened back to England, made the place, where their King was kept prisoner, known to the barons of the kingdom, and thereby procured his freedom, which took place some months afterwards; but probably under much inconvenience and ceremony, but little honorable to the Emperor Henry the 6th. and the Duke Leopold.

S. Fauchet Recueil de l'origine de la Langue et Poesie Française, p. 93.

Xy.

SONNET.

Adieu! my harp, and when again,
My hand shall strike thy quivering strings,
'T will be to wake a loftier strain,
Than ever soar'd on fancy's wings:

Than Petrach's soft and tender tone,
Than Dante's heaven aspiring rhyme;
Deep in my heart the seeds are sown,
And when their fruit shall spring sublime,

To Beatrice's shade ne'er rose,
And ne'er was laid at Laura's shrine,
Such incense of their lover's woes,
As I, dear Maid! will lay at thine.

D.C.T.

INQUIRIES OF THF ROYAL SOCIETY OF LONDON, A. D. 1667.

It may be amusing to the reader to know the state of ignorance on some subjects of science, about the period of the institution of the " *Royal Society of London.*" This will be learned in some measure by the following queries propounded by this (at that period,) preeminently learned body.

In the 23d. number of the " *Philosophical Transactions*," issued on the 11th. March 1667 are contained " amongst some inquiries for Suratte and other parts of the East Indies," the following:—

1. " Whether near the fort of Ternate there be a plant, call'd by the inhabitants *Catopa*, whence fall little leaves, which are turned into butterflies?"

2. " Whether it be true, that the only antidote hitherto known, against the famous and fatal Macassar poyson, is *humane* ordure, taken inwardly? And what substance that poison is made of?"

3. " Whether the Indians can so prepare that stupifying herb, call'd *Dutroa* or *Datura*, that they make it lie several days, months and years, according as they design it, in a man's body without doing him any hurt, and at the end kill him, without missing an hour's time?"

4. " Whether there be found in the head of a certain snake, a stone, which laid upon the wound of any venemous creature, sticks fast to it and draws away all the poyson: then being put in milk, voids its poyson, and turns the milk blue; and then applied again, draws out the rest of the poyson, that may be behind, till the wound be perfectly cleared?"

Amongst the inquiries for Virginia is the following:—

5. " Whether at the bottom of the bay of Cheasapeak northward, the natives be still of such a Gigantick stature, as has been reported? And, whether there be another people, not far from these eastwardly, of a *dwarfish stature*?"

Amongst those for Brasil is the following:—

6. " Whether it be true, that the Locust of Brasil call'd *Caayara* changeth in the spring time of that country into a plant, and withers away like a plant? And whether, in the same country, that kind of Eruca, call'd by the Portugals *Lagartas des Verias*, turns into a bird, admirable for colour and swift flying, the change thereof being made so leisurely, that we may, for a while, see half of the insect, and the other half of the bird, which the natives call *Guainumbi*, the Portugals, *Pegrafel*.

Lastly, amongst those for Egypt are the following:—

7. " Whether the *ichneumon* or Ægyptian water rat can kill a crocodile, by skipping into his mouth and gnawing his way out, as old writers affirm?"

8. "Whether children born there in the eighth month, do usually live, *contrary to what is believed to happen in other countries?*"

The character of these inquiries exhibits the wonderful advancement, which has taken place, in the natural sciences, more especially in the course of the last one hundred and sixty years.

Xy.

BELLS AS A PART OF THE TRAPPING OF HORSES.

It would seem that, antiently, in England no person was gallantly equipped on horseback, unless the horse's bridle or some other part of the trappings was stuck full of small bells. In the Metrical Romance of "*Richard Coeur de Lyon*," written about the close of the thirteenth century, the custom referred to:—

"Hys crouper heeng al ful of belles"

and Vincent of Beauvais who wrote about 1264, censures this piece of pomp in the knights-templars. They have, he says, bridles embroidered or gilded or adorned with silver. Wickliffe in his "*Trialogue*" inveighs against the priests for their "fair hors, and jolly and gay sadeles, and bridles *ringing* by the way."

Chaucer thus describes the state of a monk on horseback in his time (in the sixteenth century.)

"And when he rode, men might his bridell *here*
"*Gingling* in a whistling wind as clere,
"And eke as lowde, as doth the chapell bell."

And he refers to the custom again:—

"For sikerly, n'ere *clinking of your belles*
"That on your *bridel* hange on every side."

Thus also, the romance of "*Roberte the Deuyll*" printed Wynkin de Worde:—

"All the fyelde gaue a greate lyght
"Of the gleyues that glystred, the stedes trembled,
"A wonder to heare the *brydles* that *gyngled*."

Spenser has also referred to it more than once.

"Her wanton palfrey all was overpsred
"With tinsell trappings, woven like a wave.
"Whose bridle rung with *golden bels* and bosses brave."

One of the latest contemporary references to this fashion is in the year 1503, at the marriage of the Princess Margaret. "In specyall the Erle of Northumberlannd ware on a goodly gowne of tynsill, fourred with hermynes. He was mounted upon a fayre coarser, hys harnays of goldsmyth worke, and thorough that sam was seven small belles, that maid a mellodyous noyse." *Leland. Collect.* t. iii.

GOSPEL.

The word *gospel* is derived from two Anglo-Saxon words; *Godes* and *spell*, signifying God's or good tidings. Abraham Fraunce, in his "*Lawyer's Logike*," 1588, says "*Gospell* or *good spell* or *Godspell*, or saying"; and in the readings on the Collects, "emprynted at Westminster by Wyllyam Caxton, the last day of July Mcccclxxxviii" we have "*Festum sancte Luce Euangeliste*: Christe had four euangelistes, that are Marke, Matthew, Luke and Iohan: they wrote the four gospelles (a gospel is no more to say but *God spel*, the worde of God,) they wrote &c."

In a paraphrase of the gospel histories, entitled "*Ormulum*," by one Orm or Ormin and written not later than the reign of Henry II: or about the middle or commencement of the 12th. century, the word is written *Godspelle* as in the following lines, quoted by Tyrwhitt in his edition of Chaucer.

"Ic hafe sett her o this boc among *Godspelles* wordes
"All thurh me selfen manig word, the rime swa fillen."

And again:—

"And ic ne mihte noht min fers ay with *Godspelles* wordes
"Wel fillen all, and all forthi sholde ic wel ofte nede
"Among Godspelles wordes don min word, min fers to fillen."

In "*Pierce the ploughman's crede*" published in 1553 the word is also written *Godspel*.

UNIVERSITY INTELLIGENCE.

Public Examination.—(*Continued from page* 159.)

SCHOOL OF NATURAL PHILOSOPHY.

1. What is the principle on which you determine the circumstances of the collission of non-elastic bodies? Investigate the theorem derived from it. If a ball of ten ounces, moving with a velocity of six feet per second, strike a ball of five ounces, moving, in the same direction, with a velocity of three feet, with what velocity will they move, after the impact?

2. Answer the same questions, with regard to elastic bodies.